Dielectron Production in A-A Reactions at 1.0 A·GeV

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Measurements of dielectron production in nucleus-nucleus collisions offer a unique probe into the dynamics of heavy-ion reactions. Dielectrons are not subject to the same rescattering rates within the collision as hadronic participants and can yield direct information about internal properties of the reacting system. Important features such as baryon resonance formation, sub-threshold meson production (η, ρ, and ω), and $\pi^+\pi^-$ annihilation have been predicted to contribute to dielectron production at Bevalac energies[1]. Dielectron production measurements have yielded interesting results at both Bevalac[2] and SPS[3] energies where unresolved differences between the data from p-A and A-A collisions have been found.

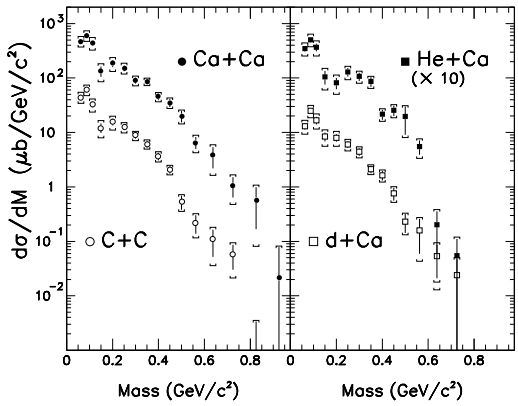

Figure 1: Dielectron cross sections in A-A systems at 1.0 A·GeV.

The Dilepton Spectrometer (DLS) Collaboration has performed dielectron cross section measurements in Ca+Ca, C+C, He+Ca, and d+Ca reactions at 1.0 A·GeV. The invariant mass spectra, $d\sigma/dM$, from the four measurements are shown in Fig. 1. A common shape to the four spectra at low mass includes a large signal below the pion mass suggesting π^0 Dalitz decays and a distribution in the 0.2-0.4 GeV/c^2 mass region resembling that predicted from η Dalitz decays[1]. The cross sections in this low mass region are found to scale in proportion to the product of the projectile and target numbers, $d\sigma/dM \sim (A_p \cdot A_t)^{1.0}$.

A direct comparison of the cross sections from Ca+Ca and C+C reactions is shown in Fig. 2 as the ratio in the measurements as a function of the pair mass. The low-mass scaling with $(A_p \cdot A_t)^{1.0}$ is illustrated by the dashed line in the figure marking the $A_p \cdot A_t$ ratio value. For $M \geq 0.5$ GeV/c^2, the ratio increases significantly indicating that a density dependent mechanism(s) is exhibited in the high-mass cross section.

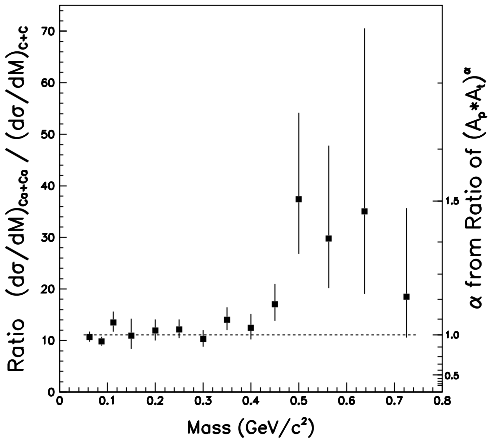

Figure 2: Cross section ratio from Ca+Ca and C+C reactions.

References

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